REMARKS

This paper is filed in response to the Office Action mailed on January 22, 2004. Claims 14-58 are currently pending. Claims 14-58 have been examined. Of these, Claims 14, 18-26, 29-33, 36, 38-44, 47-49, 53, 54, and 58 stand rejected. Claims 15-17, 27, 28, 34, 35, 37, 45, 46, 50-52, and 55-57 are objected to as being dependent upon a rejected base claim, but otherwise are indicated allowable by the Examiner. Claims 59-62 are new. Consideration of Claims 14, 18-26, 29-33, 36, 38-44, 47-49, 53, 54, and 58-62 is respectfully requested.

The Rejection of Claims 14, 18-23, 24-26, 29-30, 31-33, 36, 38, 39-41, 42-44, 47-48, 49, 53-54, and 58 Under 35 U.S.C. § 102(b) and 35 U.S.C. § 103(a)

Claims 14, 18-23, 24-26, 29-30, 31-33, 36, 38, 39-41, 42-44, 47-48, 49, 53-54, and 58 are rejected under 35 U.S.C. § 102(b) as anticipated by, or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Sterzel (U.S. Patent No. 4,828,941).

Claims 14, 24, 31, 38, 39, 42, 49, and 58 are the independent claims, all other rejected claims being ultimately dependent from one of the independent claims.

Claims 14, 24, 31, 39 and 42 recite having a porous substrate with a graft polymer filling the pores, the graft polymer is bound to the surface of the pore, and the graft polymer has proton conductivity. Claim 38 recites irradiating with energy a porous substrate, contacting the substrate with monomers, and allowing the monomers to polymerize in at least one pore wherein one end of the resulting polymer molecule is bound to a surface of the pore. Claim 49 recites applying a sol to a first electrode; forming a porous thin layer from the applied sol, filling a polymer in pores of the porous thin layer to form an electrolyte membrane on the first electrode; and attaching a second electrode onto the electrolyte membrane. Claim 58 recites a porous substrate, wherein a proton conductive, graft polymer is chemically bound to a surface of the pore.

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The Examiner states,

> Sterzel teaches a methanol/air fuel cell consisting of a cathode an anode, and a permeable anion exchange membrane as an electrolyte wherein the membrane is made of a base polymer obtained by grafting vinyl pyridine onto polytetrafluoroethylene.
>
> Since Sterzel teaches the a [sic] permeable anion exchange membrane then inherently the graft polymer would fill in the pores and be bound to the surface of the pore must also be obtained [sic].
>
> In addition, the presently claimed property of the graft polymer filling in the pores and be [sic] bound to the surface of the pore would have obviously have [sic] been present once the Sterzel product is provided. *In re Best*, 195 U.S.P.Q. 433 (C.C.P.A. 1977).

In order for a reference to be anticipatory, a reference must exactly describe each and every element exactly as in the claims.

A *prima facie* case of obviousness requires (1) a suggestion or motivation in the references or in the knowledge generally available to combine references or modify a reference; (2) there must be a reasonable expectation of success; and (3) each and every element must be found in the references.

Applicants submit that the Sterzel reference does not describe, teach or remotely suggest a porous substrate filled with a graft polymer as recited in Claims 14, 24, 31, 38, 39, 42, 49 and 58; the Sterzel reference does not describe, teach or remotely suggest that the graft polymer filling the pores has proton conductivity as recited in Claims 14, 24, 31, 39, 42 and 58; and the Sterzel reference does not describe, teach or remotely suggest the steps recited in Claims 38 and 499.

The Sterzel reference describes the base polymer for the membrane can be a copolymer which is obtained by grafting vinyl-pyridines onto polytetrafluoroethylene. There is no teaching or suggestion of a graft polymer that is not also the base polymer, that is bound to a surface of a

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pore of the base polymer. The base polymer in the Sterzel reference cannot be both the substrate and the graft polymer filling the pores of the substrate, as recited in the claims 14, 24, 31, 38, 39, 42, 49 and 58. To do so, is to read a limitation out of the claims.

Furthermore, the claimed invention as defined by Claims 14, 24, 31, 39, 42 and 58 recites the graft polymer as having proton conductivity. The Sterzel reference does not describe, teach or remotely suggest a graft polymer having proton conductivity, wherein the graft polymer fills the pores in the Sterzel reference. In direct contrast to the invention defined by Claims 14, 24, 31, 39, 42 and 58, the Sterzel reference describes that anions (e.g., OH^-), not cations, migrate through the anion exchanger membrane. See Col. 8, lines 20-25 that states, "[t]he OH^- ions formed at the cathode migrate through the anion exchanger membrane to the anode, where they react with the hydrogen ions formed there to give water. At the same time, the carbon dioxide formed at the anode reacts with the OH^- ions to give bicarbonate ions (HCO_3^-)"; and Col. 6, lines 59-63, "[i]n contrast to the prior art cation exchanger membranes as solid electrolytes, transport of current in the novel methanol/air fuel cells takes place through migration of the hydroxyl ions, which are formed at the cathode, to the anode." Furthermore, a clear teaching against the claimed invention is found on Col. 5, lines 7-9, "[t]he hydrogen ions formed at the anode cannot penetrate far into the anion exchanger membrane, and form a charge cloud around the anode." Thus, clearly the Sterzel reference teaches against the graft polymer filling the pores as having proton conductivity. As for Claim 38, the Sterzel reference does not teach, describe or remotely suggest irradiating with energy a porous substrate that does not swell substantially with organic solvents or water. As for Claim 49, the Sterzel reference does not describe or remotely suggest any of the steps recited therein.

Assuming for the sake of argument that Sterzel describes a porous anion exchanger membrane. Applicants submit that the use of a porous substrate as an electrolyte (or anionic

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exchanger membrane) would have caused methanol crossover to occur. Methanol crossover is a disadvantage with prior art methanol fuel cells that is reduced by the embodiment of the present invention containing a porous substrate that is filled with a graft polymer, wherein the graft polymer is bound to the surface of the pore. The Sterzel reference is silent on methanol crossover. Therefore, one can conclude that the Sterzel reference does not use a porous substrate, otherwise the problem of methanol crossover would have arisen by the use of the porous substrate.

Furthermore, the use of a porous substrate wherein one end of a molecule of a graft polymer having proton conductivity is bound to a surface of the pore as in the embodiment of the invention defined by Claims 14, 24, 31, 39, 42 and 58 advantageously reduces methanol crossover. This is due in part to the graft polymer being incapable of releasing from the surface of the pore, since one end of the graft polymer molecule is bound to the surface of the pore.

The Sterzel reference does not teach, describe, or remotely suggest the claimed invention as defined by Claims 14, 24, 31, 38, 39, 42, 49 and 58. Accordingly, these claims are neither anticipated by nor obvious in view of the Sterzel reference.

The remainder of the rejected claims being ultimately dependent on one of the Claims 14, 24, 31, 38, 39, 42, 49 and 58; the withdrawal of the rejection of Claims 14, 18-23, 24-26, 29-30, 31-33, 36, 38, 39-41, 42-44, 47-48, 49, 53-54, and 58 is respectfully requested.

New Claims 59-62

Applicants submit that Claims 59-62 are allowable over the references of record.

Japanese Laid-Open Patent Application No. 3-98632

An English translation of the previously cited Japanese Laid-Open Patent Application No. 3-98632 is being provided. Consideration is respectfully requested before the next Office Action.

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CONCLUSION

In view of the foregoing remarks, applicants submit that Claims 14-62 are allowable. If the Examiner has any further questions or comments, the Examiner is invited to contact applicants' attorney at the number provided below.

Respectfully submitted,

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